Claims:

What is claimed is:

1. A method for process monitoring, the method comprising the steps of:

receiving a sample that defines a cavity, said sample made of at least a first material;

determining at least one characteristic of the cavity;

receiving a sample that comprises a processed cavity filled with a second material;

directing a beam of charged particles towards the sample, so as to induce X-ray emission from a first portion of the sample, said first portion at least partially overlaps the processed cavity;

detecting X-ray emitted from said first portion; and

providing an indication about the process in response to detected X-ray emission from the first portion and the at least one determined characteristic of the cavity.

2. The method of claim 1 wherein the step of determining comprises measuring at least one dimension of the cavity at one or more locations.

3. The method of claim 1 wherein the step of determining comprises estimating a volume of the cavity.

4. The method of claim 1 wherein the step of determining comprises scanning a portion of the cavity with a radiation beam.

5. The method of claim 1 wherein the cavity is processed by polishing a previously filled processed cavity.

6. The method of claim 1 wherein the second material is optically oblique.

7. The method of claim 1 wherein the indication reflects the presence of voids within the first portion.

8. The method of claim 1 wherein the indication reflects a shape of the filled cavity.

9. The method of claim 1 wherein the indication reflects the thickness of the processed cavity at various locations.

10. The method of claim 1 wherein the sample defines multiple cavities that are processed to provide multiple processed cavities, each cavity associated with a different portion of the sample.

11. The method of claim 10 wherein the steps of directing a beam and detecting emitted X-rays are repeated for each of the multiple processed cavities.

12. The method of claim 11 wherein the indication about the process is responsive to the detected X-ray emission from the portions associated with each processed cavity and a determined characteristic of at least one cavity.

13. The method of claim 10 further comprising providing a map of the sample indicating X-ray emission measured in response to the detected X-ray emission from the multiple portions of the sample.

14. The method of claim 10 further comprising a step of locating the multiple processed cavities.

15. The method of claim 14 wherein locating a processed cavity comprises acquiring an image of an estimated vicinity of the processed cavity and processing the image to locate the processed cavity.

16. The method of claim 15 wherein the image is acquired by scanning the sample within an acquisition window.

17. The method of claim 16 wherein a processed cavity is scanned within a scanning window that is smaller than the acquisition window.

18. The method of claim 1 wherein the indication is further responsive to a reference parameter.

19. The method of claim 18 wherein the reference parameter is responsive to at least one measurement of at least one other processed cavity.

20. The method of claim 18 wherein the reference parameter is responsive to an estimated X-ray emission.

21. The method of claim 1 further comprising a step of changing a characteristic of the beam of charged particles to provide a changed beam.

22. The method of claim 21 further comprising directing the changed beam towards the sample, so as to induce X-ray emission from a second portion of the sample, said second portion at least partially overlaps the processed cavity; and detecting X-ray emitted from said second portion.

23. The method of claim 22 wherein the indication about the process is further responsive to detected X-ray emission from the second portion.

24. A method for process monitoring, the method comprising the steps of:

receiving a sample comprising at least two materials;

scanning an area of the sample such as to induce X-ray emission from a first portion of the sample;

detecting X-ray emitted from said first portion; and

providing an indication about the process in response to the detected x-ray emission, wherein the step of providing comprises applying a quantitative analysis correction technique on the detected X-ray emission.

25. The method of claim 24 wherein the technique is ZAF analysis.

26. The method of claim 24 wherein the estimated detected radiation is responsive to detected X-ray measurements from at least one other area of the sample.

27. The method of claim 24 wherein the estimation is responsive to an acceleration voltage applied on a beam that scans the area.

28. The method of claim 24 wherein the indication reflects a presence of a void within the first portion.

29. The method of claim 24 wherein the indication reflects a shape of the area.

30. The method of claim 24 further comprising a step of providing an estimate of a characteristic of a reference object and wherein the indication is responsive to said estimated characteristic.

31. The method of claim 30 wherein the characteristic is a thickness of the reference object.

32. The method of claim 30 wherein the characteristic is measured at a location that is selected such as to provide an indication of the characteristic.

33. The method of claim 30 wherein the location is selected in response to a process characteristic.

34. The method of claim 30 wherein the location is positioned substantially at a center the reference object.

35. The method of claim 30 wherein the reference object is large.

36. A system for process monitoring, the system comprising:

means for determining at least one characteristic of a cavity defined by a sample made of at least a first material;

means for directing a beam of charged particles towards the sample so as to induce X-ray emission from a first portion of the sample, said first portion at least partially overlaps a processed cavity; whereas the cavity was processed to provide the processed cavity filled with a second material;

at least one detector for detecting X-ray emitted from said first portion; and

a processor, coupled to the at least one detector, for providing an indication about the process in response to detected X-ray emission from the first portion and the at least one determined characteristic of the cavity.

37. The system of claim 36 wherein the indication reflects the presence of voids within the first portion.

38. The system of claim 36 wherein the indication reflects a shape of the filled cavity.

39. The system of claim 36 wherein the indication reflects the thickness of the processed cavity at various locations.

40. The system of claim 36 wherein the sample defines multiple cavities that are processed to provide multiple processed cavities, whereas each processed cavity is associated with a different portion of the sample.

41. The system of claim 40 wherein the means for directing a beam are further adapted to direct the beam toward each of the multiple processed cavities and to measure the emitted X-ray from each processed cavity.

42. The system of claim 41 wherein the processor is adapted to provide an indication about the process in response to the detected X-ray emission from the portions associated with each processed cavity and a determined characteristic of at least one cavity.

43. The system of claim 41 wherein the processor is further adapted to provide a map of the sample indicating X-ray emission measured in response to the detected X-ray emission from the multiple portions of the sample.

44. The system of claim 41 wherein the system is further adapted to locate the multiple processed cavities.

45. The system of claim 36 wherein the indication is further responsive to a reference parameter.

46. The system of claim 36 further capable of changing a characteristic of the beam of charged particles to provide a changed beam.

47. The system of claim 46 further adapted to direct the changed beam towards the sample, so as to induce X-ray emission from a second portion of the sample, said second portion at least partially overlaps the processed cavity; and to detect X-ray emitted from said second portion.

48. The system of claim 47 wherein the indication about the process is further responsive to detected X-ray emission from the second portion.

49. A system for process monitoring, the system comprising:

means for scanning an area of the sample such as to induce X-ray emission from a first portion of the sample;

at least one detector for detecting X-ray emitted from said first portion; and

a processor for applying a quantitative analysis correction technique on detected X-ray emission and in response provide an indication about the process.

50. The system of claim 49 wherein the indication reflects a presence of a void within the first portion.

51. The system of claim 49 wherein the indication reflects a shape of the area.

52. The system of claim 49 further adapted to provide an estimate of a characteristic of a reference object and wherein the indication is responsive to said estimated characteristic.